Volume 11, No.2, July 2009

# WIND ENGINEERING SOCIETY Newsletter

Dr. Graham Knapp, Editor

## Contents:



Event report: Flying debris

Wind Engineering Society
c/o the Institution of Civil Engineers
One Great George Street
Westminster
London SW1P 3AA
Telephone: +44 (0) 20 7665 2238
Fax: +44 (0) 20 7799 1325
wes@ice.org.uk
http://www.windengineering.org.uk

WES Newsletter Editor
Graham Knapp
Buro Happold Ltd
2 Brewery Place
Brewery Wharf
Leeds LS10 1NE
Telephone: +44 (0)113 204 2200
DDI: +44 (0)113 204 2961
Fax: +44 (0)870 787 4144
Graham.Knapp@BuroHappold.com

# WES NEWSLETTER

Volume 11, No. 2: July 2009


## ❖ Chairman's Column

**John Owen, University of Nottingham**

As I pen my first chairman's column I'd first like to express my thanks to my predecessor, David McKenzie of Flint & Neill. I have enjoyed working with David during my time as honorary treasurer and want to acknowledge the hard work that he has put in encouraging corporate membership of the society. David's final duty as Chairman has been to coordinate this year's Scruton lecture. I'm delighted that he has succeeded in recruiting an excellent speaker in Svend Ole Hansen for this prestigious event on November 17. Svend's talk will be on Vortex Induced Vibrations and I look forward to seeing you all there.

David was also instrumental in putting together the recent Eurocodes conference; see the report later in this issue. It was heartening to see so many there for this event, the turnout was an excellent reminder of the importance of Wind Engineering for both large and small consultancies. This is especially encouraging at the current time, as we face a very significant cut in the support we receive from the ICE. There is clearly an important rôle for the Society to play and we will be seeking to increase our activity in the coming year to fulfil this rôle better and draw in new members. As an academic, I am particularly keen that the society should be more active in the University sector. There is clearly a need for further research in Wind Engineering and the society already provides a forum where practice can inform the research agenda, Tom Wyatt's piece in this edition of the newsletter being a good example. However, I am also aware that Wind Engineering is often neglected in our undergraduate degree programmes and as the Wind Engineering Society we should be concerned by this. The profession needs graduates with a good grasp of the Wind Engineering fundamentals, so what can we be doing to influence what our undergraduates are taught?

Looking ahead to the autumn, we have two further technical meetings planned in addition to the Scruton Lecture on November 17. On September 2, John MacDonald is organising an evening meeting on the wind-induced vibration of cables. Then on October 28 we will be holding our biennial research day. This has traditionally been an opportunity for postgraduate students to present their projects, but this year we are hoping to broaden its scope. As well as student presentations, we also hope to have contributions from other research organisations and to take a more strategic look at Wind Engineering research needs. Finally in this look ahead, I want to draw your attention to the announcement of our next conference, which will be held in Bristol in September 2010.

## ❖ Society News

Following the Society AGM, the executive committee of the UK Wind Engineering Society is now as follows:

Peter Bearman **
Melissa Burton, Treasurer
Gordon Breeze **
Ian Castro **
Graham Knapp
Brian Lee
John Macdonald
David Mackenzie, Past Chairman
John Owen, Chairman **
Brian Smith
Nicholas Waterson *
Thomas Wyatt

* - new member ** - second term

### *New WES Website*

The Wind Engineering Society has updated its image with a new website, available at the address below:

**http://www.windengineering.org.uk**

### *Webmaster needed*

This would be an ideal way for an engineer working towards chartership to demonstrate involvement with professional activities, or for any member to stay up to date with the wind engineering community. Any interested parties should contact Adam Kirkup at the ICE on +44 (0)20 7665 2262 or email adam.kirkup@ice.org.uk

WES NEWSLETTER

Volume 11, No. 2: July 2009

## Comment

### *Wind Loading of Structures*

*Tom Wyatt*

**A personal comment on the current status of codification and design guidance**

Long years at the interface between structural design and wind engineering may allow one to develop insights, but also generates frustration at the low rate of progress, especially in formalising design guidance in Codes of Practice. By the time Kit Scruton initiated the international conference sequence at Teddington in 1963, Industrial Aerodynamics was already flourishing at NPL and Alan Davenport had unveiled comprehensive stochastic modelling of gust action – indeed, I had by that time applied a statistical analysis of readings from an anemometer array at Ann Arbor to prediction of the drive requirements for the 60m radiotelescope at Parkes. The basic CP3 Chapter V Part 2 for wind loading on buildings arrived in 1969, but it was still being revised through to 1988, with no dynamics and a crude estimate of a '15sec gust' for areas with a dimension exceeding 50m. Kit Scruton had the discretion to resign in frustration, and did so, but Cyril Newberry, as a committee member ex-officio, could not. Nevertheless, the UK remained at the forefront of production of useable data, with Ian Harris and his co-workers on the ESDU Data Items relating to wind structure, and Newberry, Eaton, Mayne and Cook at BRE generating data at full scale as well as procedures for its application. This was truly a time of leadership.

When BS6399 Part 2 arrived, it had taken these advances on board, mobilised through Tom (Vincent) Lawson's 'TVL' relationship of the appropriate gust-averaging time to mean velocity and loaded-length. BS6399 has been vociferously criticised for complexity ever since, despite the clarity of the underlying principles, leading one to suspect unrealistic expectations on the part of the practicing structural design community. However, by the time of its publication, there was already a draft of the Eurocode on my shelf. It is in fact hard to find more than fine-tuning between the 1991 draft and the eventual EN1991-1-4, and we had to wait until late in 2008 for the UK National Annex. We still await a British Standards Institution contribution to 'non-contradictory complimentary information', PD6688-1-4, currently in the publication pipeline.

A key issue is that whereas the preparation of Eurocodes that are focused on specific materials has been supported by the respective trade organisations, this has not been true of wind loading. Of course, there is only limited commercial advantage to a 'material-focussed' trade organisation in supporting loading research, despite the fact that virtually every practicing structural engineer will have to predict wind loading. It is apparent that this lack of support for advancing knowledge of loading now applies across wind engineering research and development, exemplified by the dominance of dispersion studies in the currently-funded work reported to our conference last year. Although our contacts at the Institution of Civil Engineers have become increasingly supportive, I am not sanguine concerning early change.

The Eurocode formulation, while not explicitly based on the Davenport postulates (Proc. ICE 1961, 1962), uses algebra that clearly expresses the Davenport model. However, by the seventies, the BRE full-scale studies had clearly shown that the respective postulate quantifying spatial correlations of pressure was grossly non-conservative. This is not to say that the Eurocode is unsafe; the companion postulate for point-pressure fluctuation is probably very conservative (the Conference retrospective of the achievement of Silsoe in full-scale studies had considerable interest on this point), but clearly the Eurocode does not represent the best that could be done forty years on from the establishment of the model. It would also be a remarkable coincidence if front-rear incoherence of gust action were best represented by a simple factor applied to the total load, including mean values, independent of the intensity of turbulence. Pursuing criticism in the field of my personal interests in dynamic response, EN1991-1-4 does not attempt estimation of response of buildings in the crosswind direction.

Although there have been few full-scale studies since the BRE work, the last 20 years have been marked by an extraordinary development of wind tunnel techniques, now employed ad-hoc on an unprecedented scale, but the structure of the industry means that general knowledge and understanding has not exploited this resource. Could this be changed? Can we revive support for studies of wind loading?

WES NEWSLETTER

Volume 11, No. 2: July 2009

## *Thomas Vincent Lawson FREng, 1925-2009 –"reminiscence" by Nicholas Cook.*

My direct interaction with Tom Lawson in the Aero department at Bristol University lasted just 6 years – my final undergraduate year, three years as his PhD student and two as his research assistant. The first thing he ever said to me was 'my name is not "sir", its Tom'. Looking back, I find it hard to believe how lucky I was and that so much happened from 1966 to 1973.

I'm not sure when Tom's interest in industrial aerodynamics started but, together with Alan Simpson, he introduced an industrial aerodynamics option into the 1996-7 third-year Aero course. Tom had already solved the problem of the Re-transition galloping of the Severn Crossing power line and Alan was working on the twin-conductor galloping problem for CEGB. My 3rd year project was to determine the lift and drag coefficients of each conductor of the pair, for various spacings and angles, and Tom was my supervisor. Then Tom organised a PhD project funded by the CEGB research labs at Leatherhead and set me to work investigating the effect of turbulence scale on the flow around tall buildings. Then, as his research assistant, I worked on ABL simulation development in short wind tunnels. Finally, I worked directly for him on consultancy contracts, the last being the redevelopment of Victoria Street. I remember the Westminster Council representative withdrawing his objection to a particularly windy spot when Tom demonstrated it was caused by the Council's own tower block on the opposite side of the street. Even now, walking down Victoria Street, I sometimes imagine that a huge hot-wire probe might descend from the clouds.

Tom established a relationship with the Department of Architecture, which led him to advise architects on environmental winds and master-planning. He wrote technical notes for the Architects Journal. When the Department of Architecture decided it was time to hold a course for architects and advertised this as "Some aspects of the built environment" it attracted only 4 enquiries, well short of the 20 or so needed to break even. Tom took over, re-advertised exactly the same course as "Wind effects on buildings" and we had a full house. Architects who came to Tom instructed their consulting engineers to do the same and, gradually, this grew into a consultancy practice. Tom developed a particular rapport with Ken Anthony at Arup, which drove the development of analysis and reporting. This was Tom's great gift: whatever preconceptions a client had, Tom would analyse the essential problem, tell him what was really needed and then get it done.

When Tom started serious wind engineering, we were measuring mean and RMS values using a mixture of digital and analogue meters. First attempts and obtaining maxima were by measuring traces on a storage oscilloscope. We located a Solatron analogue computer which had been used to solve differential flight equations. It had a good frequency response and included a number of multiplier units so, before long, we were using this to measure two-point correlations. Frequency analysis was done by playing back signals recorded on a FM data tape recorder at 100 times speed through a band-pass filter set. The tape recorder worked in both directions: so on the audio track we would say "zero" and "calibration" at the beginning of each run, followed by "nusharbilac" and "warez" at the end. Wind engineers of today have it so easy!

The data analysis breakthrough came when Tom obtained SRC funding to purchase a Hewlett Packard digital computer. We trundled this monster down the lab to the hatch for hoisting it up into the mezzanine space above. When the hoist ran out of travel, the wheels of the computer were still a foot below mezzanine level. "Time for lunch, I think" said Tom, "I'm sure the technicians can manage the last bit". And so, with £25k of electronics hanging from the ceiling we went for a Senior Common Room lunch. When we got back, sure enough, the monster was sitting in its appointed place.

Tom and I would go regularly to the industrial aerodynamics research meetings at NPL. Tom would barrel up the A4 in his Citroen DS and, later, a Jaguar. The sun always came up near Marlborough. Somehow, we were never late, but sometimes it was close. NPL was the centre for wind engineering research at that time: Kit Scruton, Roger Whitbread, Peter Bearman & Barry Vickery would be there and POAL Davies would come up bringing students from Southampton. Although Tom was interested in the latest research, he was more interested in its potential usefulness for the construction industry.

One day, just before his retirement, Prof. Collar tapped me on the shoulder and said "Time to go out into the big wide world, my boy." Tom was influential in arranging for me to interview BRE to see if it was a suitable employer and they passed. So I went off to build a wind tunnel for BRE and Tom got to concentrate almost full time on his consultancy. My contact with Tom in later years was sporadic, but always welcome. Initially, there were the NPL research meetings, which later moved to BRE, then became the core of the Wind Engineering Society. Tom also chaired the regular ESDU Wind Engineering panel meetings to which other WES luminaries, like Tom Wyatt and Brian Smith would also contribute.

For obvious reasons, Tom championed the 'TVL' formula relating tributary area to gust duration, but his greatest and lasting influence was in the field of environmental winds. First with Westminster Council and then with the Docklands Development Agency he developed a simple pragmatic set of criteria for acceptability, coining some new terms for pedestrian activities – "leisure walking" and "business walking". These were widely adopted by other councils and are still the industry standard for environmental impact assessments in the UK. Tom's achievements were recognised by his election to a Fellowship of the Royal Academy of Engineers.

Tom worked on at Bristol with a number of assistants: first his long-suffering technician Tom Everett, Gordon Breeze and Wayne Pearce. In 1999 Tom decided it was time to retire properly. Wayne continued the consultancy virtually single-handedly and I was co-opted in, part time, to develop it. Eventually it was clear that we needed better facilities than Bristol could provide and so we needed to move elsewhere. Telling Tom was the hard part, but he assured me that he understood and approved our reasons, and that he wished us every success. Tom's consultancy now thrives as part of RWDI Anemos, but it is certain that all the other Wind Engineering consultancies now practising in the UK are firmly founded on Tom's pioneering development of this field.

The title of "Father of Wind Engineering" is already taken: it was first given to Martin Jensen by Alan Davenport, and then passed back to Alan Davenport by the IAWE in 1997. The memory of Kit Scruton is kept alive by the WES Scruton lecture series. How, then, shall we remember Tom Lawson? You could remember him as the "Father of Wind Consultancy", or you could just remember: $TV/L \approx 4.5$.

A more formal obituary is on the Bristol University web site: http://www.bristol.ac.uk/news/2009/6390.html

WES NEWSLETTER

Volume 11, No. 2: July 2009

## ❖ WES Event reports

### *WES Technical Meeting on Flying Debris - 6th May 2009* — *Professor Ian Castro*

WES technical meetings have classically concentrated on the effects of wind on essentially fixed objects. In recent years, however, there have been a few meetings on how the wind moves non-fixed 'stuff' - pollutants, for example, and, in May last year, yachts and other kinds of wind driven locomotion. This year's May meeting continued this sequence by considering how debris arising from severe wind conditions is subsequently transported by the wind. It was five years ago that Chris Letchford gave a seminar at the University of Sydney which suggested, in its title, that windborne debris is perhaps 'the next big break in Wind Engineering'. Whilst subsequent events have not really confirmed that prediction, there is certainly significant ongoing interest in the subject, not least because of the devastating wind storms that have occurred at various points around the globe since then. In the first of the two talks at this meeting, Chris Baker - the holder of the only publicly funded current research grant on this topic in the UK - gave a splendid introduction to the topic. He started by pointing out that airborne debris has led to injury and death (even in the UK in the last five years) and perhaps 50% of hurricane damage can be attributed to debris impact, so the topic remains of great practical importance, as Letchford's seminar title implicitly asserted.

Chris introduced the pioneering Japanese work of Tachikawa in the 1980s and then surveyed something of what (relatively little) has been done since and what is being done currently. He described further development of earlier analyses on debris flight and some recent experiments on determining the forces and moments which, it was admitted, remain major unknowns in the understanding of debris flight. This led naturally to Peter Richards' presentation, which discussed recent experiments in the Auckland wind tunnel, designed and executed in collaboration with the Birmingham and Nottingham groups. The objectives included determining both steady and unsteady forces on various types of debris. He also illustrated some of the results from flight trajectory experiments, again with different shapes of debris. The talk nicely illustrated the significant extent to which debris trajectories depend on flow conditions around the release point as well as the size, shape and mass of the debris. Peter also described experiments designed to verify the dynamic behaviour of rod-type debris during an impact. Damage is perhaps the most important practical (as opposed to scientific) question and Chris Baker's talk concluded with a brief discussion of some simple damage risk models.

So the topic was comprehensively covered, with the evening emphasising just how much remains unknown and that the simplified assumptions necessary to undertake any meaningful analysis are probably just too simple. There is thus much scope for more work; perhaps we can await the 'big break' that Chris Letchford suggested with some hope!

### *May 11th – Eurocodes on wind loading* — *David MacKenzie*

An all day conference was held at the ICE on 11th May 2009 on the background and application of EN 1991-1-4, the wind Eurocode. The speakers were all leaders in the field of wind engineering and, at £120 for non-members, the conference was extremely good value! The conference was opened by Prof R.S. Naryanan with a run through the background to the standards and a stark reminder that the code come into sole effect next year. Nick Cook then took the delegates through the changes to the wind model used in the Eurocodes and highlighted some of the major differences in the model to that in use in BS6399. Nick expressed the view, echoed by others, that the UK has had to fight hard to retain many of the sound engineering principles that underpin BS 6399. Some of these have not been retained to the detriment of the code and as a trap for the unwary.

Paul Blackmore went through the background for wind pressure coefficients and presented some of the difference between the Eurocode and current UK practice, demonstrating where significant differences lay. Andrew Allsop completed the morning's entertainment by running through the wind response aspects of the new code and the application of the National Annex.

The afternoon session started with the application of the Eurocode to special structures. Andrew continued with a review of how the Eurocode affected the design of tall buildings. Andrew also presented some highly informative wind tunnel data on wind pressure distributions on tall buildings. John Rees and Brian Smith then presented the Eurocode requirements and the National Annex provisions for lattice towers and mast and for bridges respectively. The modification to the altitude factor was presented in some detail by John; the National Annex allows a reduction in the altitude factor with height which provides significant savings in the design of tall structures. Brian reviewed the

new requirements for bridges including the modifications to BD49/01, the bridge aerodynamics code. Finally Naryanan completed the event with a discussion on the calibration studies undertaken in support of the code.

The event, a sell-out, was highly informative with the delegates benefitting greatly from the discussion between delegates and the wind experts from WES. The event was a central part of WES's remit to disseminate wind engineering advice and best practice to its members. It helped to raise the profile of WES significantly, something we should build on in the coming session.

## ❖ Codes and Standards

### *BSI to withdraw 57 British standards in 2010*

BSI British Standards has published a list of 57 structural design codes it plans to withdraw in March 2010. The majority have been superseded or made obsolescent by Eurocodes. The list includes all or most parts of well-known standards such as BS 5268 for timber, BS 5400 for bridges, BS 5628 for masonry, BS 5950 for steel, **BS 6399 for loading**, BS 8004 for foundations, and BS 8110 for concrete.

BSI is obliged to withdraw all standards that have the same scope and field of application as a Eurocode. Those partly covered by Eurocodes will be amended or revised to delete conflicting requirements and reflect the changed scope.

Committee manager Clare Price says withdrawn standards will still be available and remain in the BSI catalogue for historical information purposes, but will no longer be maintained by a BSI committee. 'That means that there is no five-year review when a committee considers the currency of a standard and decides whether to confirm, revise, or withdraw it,' she says.

According to Haigh Gulvanessian, chairman of the Eurocode Expert advisory group, 'A withdrawn standard will generally still have an acceptable level of safety, but will increasingly become outdated and therefore not current best practice as it will not be subject to maintenance by a BSI committee.'

The full list of standards being redrawn can be downloaded from BSI's new Eurocodes website at http://communicate.ice.org.uk/ve/839069ePV7574bn273/stype=click/OID=60965153838996/VT=0

For more information email cservices@bsigroup.com

### *Training Course: Actions on Structures: Eurocode 1 D9101*

Eurocodes are a pan-European set of design codes for building and civil engineering works. They will replace the existing codes published by the British Standards Institution in the UK and provide a common understanding regarding design between owners, operators, designers and contractors in civil and structural engineering. They represent the biggest change in design codes ever seen.

Eurocode 1 is the key document covering actions on structures and is fundamental to the utilisation of the Eurocode suite. This one day course introduces the Eurocode system in general and EN1991 in particular.

An overview of the structure and scope of the Eurocode system is given and the current status of integration outlined. The implementation of the Eurocode suite into UK practice is considered and the key differences with the current BSI codes are also highlighted throughout.

Details on http://www.tttrain.co.uk/courses/coursedetails.asp?COURSE_ID=369-1

03 Sep 2009 London 25 Nov 2009 Birmingham

### *Draft National Annex published for towers and masts*

BS EN 1993-3-1 Eurocode 3: Design of steel structures – Part 3-1 Towers, masts and chimneys – Towers and masts

WES NEWSLETTER

Volume 11, No. 2: July 2009

## ❖ Future WES Events

At the Institution of Civil Engineers, One Great George Street London SW1P 3AA, unless otherwise stated

### *Wind induced vibration of cables*

Wednesday 2 September 2009 at 6pm, with tea/coffee served from 5.30pm

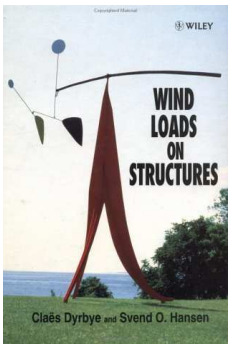
**Galloping of dry ice-free cables**

John Macdonald, Department of Civil Engineering, University of Bristol

"**Rain patters on a cable that tilts and sighs**" - Recent developments in rain-wind induced vibrations. Ian Taylor, Department of Mechanical Engineering, University of Strathclyde

### *Wind Engineering Research Day*

28 October 2009, ICE London




### *Scruton Lecture 2009: Vortex induced vibrations*

17 November 2009 at the ICE, London

We are very pleased to announce that Svend Ole Hansen will present the Wind Engineering Society's flagship event, the 2009 Scruton Lecture. Svend Ole Hansen is a consulting engineer and co-author of "Wind Loads on Structures" Further details will be available shortly for this excellent evening.

## ❖ Forthcoming Conferences

### *9th UK Conference on Wind Engineering, Bristol*

20-22 September 2010

The conference aims to continue the friendly informal tradition of WES conferences, with papers covering the full range of wind engineering topics and a good mix of research and practice. The programme will include a tribute to Tom Lawson 1925-2009, who made many contributions to the field of wind engineering in his time at Bristol.

The venue is Wills Hall, University of Bristol, set in attractive grounds not far from the Avon Gorge and Clifton Suspension Bridge, about 2 1/2 miles from the city centre.

Further details will be available shortly on the conference web site:

www.bris.ac.uk/civilengineering/wes-2010

Conference organiser: John Macdonald

Administrator: Nina Bunton

Email: wes-2010@bristol.ac.uk

Tel.: 0117 331 8304

# WES NEWSLETTER

Volume 11, No. 2: July 2009


## *International Events*

**Fifth European & African Conference on Wind Engineering (5th EACWE)**

Florence , Italy

July 19-23, 2009

http://www.eacwe5.org/

**Seventh Asia-Pacific Conference on Wind Engineering (7th APCWE)**

Taipei , Taiwan

November, 2009

http://apcwe7.wind.org.tw/

**Fifth International Symposium on Computational Wind Engineering (CWE 2010)**

Chapel Hill , North Carolina , USA

May 23-27, 2010

http://www.cwe2010.org

**Thirteen International Conference on Wind Engineering (ICWE13)**

*The Netherlands, Amsterdam*

*2011*

http://www.icwe13.org/

## *13th International Conference on Wind Engineering*

***July 10-15, 2011***

***Amsterdam, The Netherlands***

The wind engineering community in the Netherlands and Flanders is very pleased to cordially welcome you to Amsterdam for the next International Conference on Wind Engineering. Amsterdam is the capital of a country with a long history in wind engineering, as demonstrated by the large number of windmills used in land reclamation. The conference is intended to gather researchers and engineering consultants who will share the latest results of research and successful case studies in which wind is a relevant engineering and design phenomenon. The field ranges from fluid dynamics, applied meteorology, wind energy, civil engineering and city planning to design of cladding and roofing. This broad field makes this conference an interesting gathering place for all parties involved in wind-related engineering and design. The venue is very much worth visiting and a social programme organised during the conference will include cultural and historical highlights.

We are looking forward to welcoming you.

Chris Geurts, Conference Chairman

info@icwe13.org www.icwe13.org

Tel: +31 (0)20-589 32 32

Key dates

| | |
|---|---|
| Submissions open for 4-page abstracts | Early 2010 |
| Deadline for 4-page abstracts | Mid 2010 |
| Notification of acceptance | Late 2010 |
| Deadline for 8-page full paper | Early 2011 |